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In the Matter of

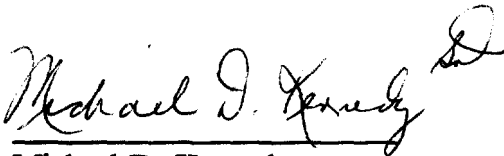
Revision of the Commission's Rules
To Ensure Compatibility With
Enhanced 911 Emergency Calling Systems

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) CC Docket No. 94-102
) RM-8143
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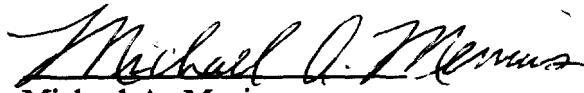
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Motorola, Inc. ("Motorola") is pleased to submit its reply to comments filed in the proceeding captioned above.

Very respectfully,



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I. E-911 COMPATIBILITY ISSUES SHOULD BE RESOLVED THROUGH ONGOING INDUSTRY PROCESSES, NOT BY REGULATORY MANDATE

The great majority of commenters support the goal of compatibility between E-911 systems and mobile operations. Nonetheless, the record makes clear that compatibility issues should be resolved through ongoing industry processes rather than government mandate. Indeed, a recurrent theme in the record is that the Commission should not attempt to leapfrog the work of industry forums in a rush to an E-911 "solution" that may benefit no one. Instead, Motorola urges the Commission to proceed more cautiously and reconsider the proposed approach to E-911 compatibility.

Wireless/E-911 compatibility involves fundamental network design issues and requires more than simple modifications to handsets and base stations.¹ PCIA, for example, states that "standards for equipment design, data transfer and interworking and interoperability must be developed for PSAPs, wireline and wireless networks, signaling systems, and PCS technologies, [which] will require the cooperation of all affected entities."² Vanguard observes that fundamental questions are unanswered even with respect to what network elements should be responsible for implementing E-911 functionalities, arguing that "[t]he enormous number of mobile handsets in operations suggests . . . that industry and standards bodies should strive for 911 solutions that focus exclusively or primarily on network

¹ See, e.g., AT&T at 26; Nextel at 5-6 (E-911 is a "system solution"); TIA at 21.

² PCIA at 16. U S West also notes that even if wireless E-911 capabilities were implemented, no public safety organizations "are capable of taking advantage of [these features] because their current equipment cannot receive and process such information and because there are no products available on the market which they can purchase." U S West at 5; see also CTIA at 18-20.

infrastructure, rather than on subscriber equipment."³ Because "[i]t is too early to rationally determine the means for achieving the[se] stated objectives,"⁴ answers to these basic questions can not and should not be resolved by regulatory fiat.

The evolutionary path to E-911 implementation is neither well-defined nor capable of being predicted with confidence. Consequently, setting standards and deadlines at this time would be premature. Instead, Motorola and others suggest the process of implementing wireless/E-911 compatibility should continue to rely on the combined efforts of network operators, the public safety community, manufacturers, and the appropriate standards-setting bodies.⁵ As noted by ALLTEL, "[t]he Commission may best pursue E911 service by providing the impetus and the forum for further industry cooperation."⁶ In other words, "[r]ather than mandate capabilities and time frames for implementation at this time, the Commission should establish a broad-based Industry Advisory Group . . . to develop appropriate, achievable, and effective recommendations for ensuring wireless E911 availability prior to embarking upon further attempts to formulate substantive rule requirements."⁷ Similarly, "U S West recommends that the better course would be for the Commission to instead play a more market management or oversight role, by monitoring (and, if necessary, encouraging and help coordinating) developments in industry standards

³ Vanguard at 15.

⁴ CTIA at 21.

⁵ See, e.g., Ameritech at 2; APC at 2; Bell Atlantic at 9-11; BellSouth at 12; CTIA at 17-18; MCI at 2; TIA at 21-22.

⁶ ALLTEL at 5.

⁷ *Id.* at 5-6.

and in the development (field testing and validation) of potential enhanced wireless 911 technologies."⁸ To facilitate the cooperative industry effort, deadlines should not be artificial calendar dates, but rather timetables linked to the industry process.

The industry process should also determine what services should be subject to E-911 compliance requirements. For example, as a number of commenters observed, neither Mobile Satellite Services⁹ nor one and two way paging¹⁰ services are technically suited for E-911 functionality, and both should be excused from compliance. The record also shows that E-911 rules should avoid requiring private systems to implement costly and unnecessary changes,¹¹ and that more flexibility is needed for SMRs in complying with any E-911 obligations.¹²

Under these circumstances, the approach to E-911 compliance in the *Notice* should be reconsidered. All parties agree that wireless E-911 functionalities can serve a vital role in preserving life and property -- but only if implemented in a consistent and considered manner that recognizes both the capabilities and limitations of wireless services. This process can and should be founded on joint industry action.

⁸ U S West at 10. PCIA "urges the Commission to reconsider the mandatory milestone approach set forth in the Notice," and instead "endorse the efforts and approach of the JEM and instruct industry bodies to continue to work toward compatibility." PCIA at 3-4.

⁹ See, e.g., AMSC at 6-8; Constellation at 1-3; Starsys at 1-5; TRW at 2-3; Westinghouse at 2.

¹⁰ GTE at 9 ("[t]raditional one-way paging systems are incapable of sending a 911 call and thus should be excluded from any 911 performance standards"); see also UTC at 6-7.

¹¹ See, e.g., Nextel at 4 n.8; Redcom at 15-16; UTC at 6-7.

¹² See, e.g., AMTA at 4-7; E.F. Johnson at 5-6; GEOTEK at 3; Nextel at 3-4; PCIA at 6.

II. THE TIMELINES PROPOSED FOR E-911 COMPLIANCE DO NOT RECOGNIZE FUNDAMENTAL TECHNOLOGICAL LIMITATIONS

The record demonstrates that the proposed timelines for E-911 compliance are premised on a number of fundamental misconceptions regarding the state and capabilities of wireless technology. Most importantly from a manufacturing standpoint,¹³ the technologies to achieve the proposed benchmarks on automatic location information ("ALI") do not exist. ALI implementation under the framework proposed in the *Notice* will not provide the functionalities and performance sought by the Commission and public safety users, and may in fact result in stranded investment, higher-cost service, more expensive and bulkier handsets, and stalled wireless growth.

A. The Three-Phase ALI Transition Framework Is Inconsistent With Technological Realities

In crafting a transition framework for ALI, the Commission should recognize that radio propagation characteristics inherently limit the precision of location information that can be achieved, especially with existing subscriber equipment. Indeed, PCIA notes the JEM report "calls into question the fundamental premise of the Notice -- that Commission-established, arbitrary deadlines for various elements of compatibility are either achievable or

¹³ Although suppliers will be involved tangentially in implementing E-911 grade of service requirements in terms of such issues as reserved channels and engineering advice, grade of service is an operator issue. Similarly, the call priority mandate will be a significant contributing factor toward achieving whatever grade of service is possible. Under the circumstances, Motorola will defer to the commenting carriers to address these system operation issues.

in the public interest,"¹⁴ and notes, in particular, that "the approach to ALI set forth in the Notice is both unworkable and imprudent."¹⁵ As discussed below, basing regulations current radio location technologies is ultimately of limited utility and may exacerbate existing difficulties, because location estimates based on propagation often will be wildly inaccurate.

The Phase I implementation rules are premised on a misunderstanding of cellular technology. The fact that 911 calls are currently assigned to the "best" cell does not imply that the callers are "located" in that cell in any sense of geographic coordinates. First, "[t]he serving cell site is not always the closest cell -- 'shadows' or 'dead spots' in certain locations may inhibit the call from being received by the cell closest to the point of transmission."¹⁶ Second, "[d]ue to the varying characteristics of a 'cell' in a wireless system, including power, antenna height and other technical criteria, the PSAP closest to the location of the base station/cell site may not be the PSAP closest to the subscriber in need of emergency assistance."¹⁷ Third, "it is not unusual for a cell site located near bodies of water to pick up a mobile station that is not within its footprint as a result of the radio waves 'bouncing' on the water."¹⁸ Finally, "in a 'directed retry' condition, the cellular telephone is instructed to originate on another sector due to traffic overloading on the primary cell site."¹⁹ Under all

¹⁴ PCIA at 2-3.

¹⁵ *Id.* at 12.

¹⁶ GTE at 17.

¹⁷ Ericsson at 6-7.

¹⁸ NYNEX at 14.

¹⁹ AT&T at 30.

of these circumstances, the geographic representation of a serving cell's coverage area is unrelated to the location of the mobile caller.

Moreover, the Phase II implementation rules require information that is not available from current or anticipated cellular location technology. As Ericsson and others note, signal strength is not significantly correlated with distance from the cell in most areas:²⁰

Received signal strength is not an appropriate means for determining distance to the cell site, especially with respect to modern wireless systems consisting of a number of overlapping cells. For example, the signal strength may be very strong when the wireless handset is in a given location. A move from that location to one just a few feet away may significantly increase or decrease the relative signal strength. Similarly, in urban environments, signals bouncing off buildings may have a dramatic impact on the signal strength received by any particular mobile terminal.²¹

In typical systems, mobiles are placed in the "best" cell/sector by actually comparing the signal strength directly between likely candidate base sites and picking the "best." As Southwestern Bell observes, the actual location of the mobile is irrelevant, and reliance on systems of estimating mobile location "can result in significant range errors."²² Thus, "[t]he accuracy of the types of systems contemplated . . . [in Phase II] would depend on a number of factors, including: the methodology adopted by hardware and software manufacturers; the availability of multiple cell sites (the triangulation method cannot work in

²⁰ GTE at 18-20; *see also* Terrapin at 5.

²¹ Ericsson at 7-8.

²² Southwestern Bell at 16 (noting "[r]eceived signal strength of a mobile unit is a very poor means for estimating distance of the unit from the cell site. Signal strength from the mobile unit is dependent upon a number of factors, including the type of antenna used, the height of the antenna and the location of the cell site").

areas where the signal is only received by one cell site); the presence of signal obstructions, and other factors over which the wireless provider has no control."²³

Finally, although the *Notice* attempts to develop a "phased-in" approach to ALI implementation, no logical progression exists from the two-dimensional Phase II concept of location to the three-dimensional Phase III concept. As Southwestern Bell explains, "[t]he three phases . . . are not a migration; different technologies would be used in each phase."²⁴ This will result in a "schedule [that] would require both carriers and PSAPs to make substantial investments that would almost immediately become obsolete."²⁵ Furthermore, as discussed below, the ability of any existing technologies to meet the Phase III goals -- within the physical limitations of a mobile service -- is highly suspect.

B. ALI Technologies Do Not Exist To Meet Phase III Implementation Criteria Within the Constraints of Mobile Communications

Of the technologies under consideration to meet the ALI requirements of Phase III, the most promising are undoubtedly the Global Positioning System ("GPS") and the In Vehicle Positioning System ("IVPS"). While these technologies have exciting possibilities in the general area of mobile communications, they both have limited usefulness in terms of E-911 access for mobile environments -- especially for portable (hand-held/pocket phone)

²³ GTE at 19-20.

²⁴ Southwestern Bell at 10-11; *see also* CTIA at 10-11.

²⁵ CTIA at 10; *see also* AT&T at 31; BellSouth at 12; Northern Telecom at 56; NYNEX at 9, 14.

applications.²⁶ Indeed, even NENA concedes that there are "tremendous technical difficulties facing the vendors contemplating providing this service,"²⁷ and AT&T notes, even less optimistically, that "there is currently no prospect of delivering accurate elevation data in the near term."²⁸

In theory, GPS can produce highly accurate positional data by resolving reference transmissions from special GPS satellites. However, GPS is unsuitable for handheld/portable mobile communications applications for several reasons:

- *First*, a GPS receiver must "see" (*i.e.*, have clear line-of-sight to) *three* satellites to determine a two-dimensional location and must see *four* satellites if altitude (three-dimensional location) is required. Thus, indoor operation is not possible.²⁹ As Southwestern Bell notes, "GPS technology is restricted by the requirement that there must be a 'line of sight'. . . GPS is . . . not technically feasible for cellular . . . communications services . . . that are widely used in urban locations or within buildings."³⁰
- *Second*, GPS response time is unacceptably slow for ALI. GPS initialization is measured in parts of minutes rather than seconds.³¹ This is unacceptably slow for ALI, which requires locational data to be sent as part of the call routing/set-up data.

²⁶ See, *e.g.*, Ameritech at 8; CTIA at 9-10.

²⁷ NENA at 3.

²⁸ AT&T at 32.

²⁹ See, *e.g.*, AT&T at 33; CTIA at 9-10; Elert at 10; Redcom at 16; Siemens at 5.

³⁰ Southwestern Bell at 18.

³¹ See, *e.g.*, U S West at 16 n.20 (estimating at least 2 minutes for a GPS location calculation).

- *Third*, "GPS requires a 'patch' type antenna that must be horizontally oriented--similar to a pack of cigarettes lying on its face."³² Even if horizontal orientation could be assured, the antenna requirements do "not fit well with today's small portable handheld phones widely in demand with the public."³³
- *Finally*, GPS implementation costs may be prohibitive. Motorola estimates that handheld and portable phone costs may increase more than \$100 per subscriber unit.³⁴

IVPS also is unsuitable for handheld and portable applications. Unlike vehicular mobile communications devices, portable units are turned off between calls to conserve battery lifetime. IVPS units, however, rely on continuous input from the user's unit in order to determine position location, including vehicle speed/distance/direction from the vehicle for dead reckoning between satellite views. As a result, IVPS systems will either significantly degrade battery life or will be unable to perform the necessary interpolation for accurate position location.

ALI will eventually be invaluable to public safety users. At this stage of development, however, there are no accurate and reliable technologies that will function given the cost and form constraints of handheld and portable cellular applications. Under the circumstances, attempting to craft specific regulations mandating wireless/E-911 compatibility must be deferred until alternative, or refined, ALI technology is available.³⁵ Motorola

³² Southwestern Bell at 18.

³³ *Id.* at 18; *see also* Elert at 10.

³⁴ Elert (noting costs of GPS receivers have fallen to "\$400 or less"); Ericsson at 9; Vanguard at 20.

³⁵ *See, e.g.*, AT&T at 36; CTIA at 7-8.

consequently urges the Commission to allow the joint industry process to continue to examine and test ALI technologies, rather than adopting rules mandating outmoded, unsuitable, and exorbitantly expensive compliance schemes.³⁶

III. CONCLUSION

Motorola supports efforts to maximize wireless/E-911 compatibility. As wireless communications devices proliferate, rapid, accurate, and reliable E-911 access will provide substantial benefits in preserving life, safety, and property. However, the record demonstrates that the Commission should act more temperately in promoting E-911 compatibility for handheld and wireless applications and refrain, at this time, from creating artificial timetables that are not based upon industry processes or technical realities. Instead, the Commission should monitor industry progress in setting feasible and cost-effective technical and network standards for E-911 compatibility.

³⁶ See, e.g., OPASTCO at 5; Northern Telecom at 58-60.